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William F. Caton
Acting Secretary
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington, DC 20554

In Re: Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band (PR Docket No. 93-144 and PP Docket No. 93-253)

Dear Mr. Caton:

On November 9, 1995, Motorola distributed the attached letter to Jay Jackson and Ed Jacobs of the Wireless Telecommunications Bureau. The original and one copy of this letter is therefore attached for inclusion in the above reference docket file. Should you have any questions on this matter, please call me at (202) 371-6947.

Sincerely,

Michael A. Lewis
Engineering Consultant
Wiley, Rein & Fielding
Counsel to Motorola, Inc.

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MOTOROLA

November 9, 1995

Mr. Edward Jacobs
Deputy Chief
Commercial Wireless Division
Wireless Telecommunications Bureau
Federal Communications Commission
Washington, DC 20554

In Re: Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band (PR Docket No. 93-144 and PP Docket No. 93-253)

Dear Mr. Jacobs:

This letter is intended to further articulate the positions of Motorola regarding the proposed modifications to the 800 MHz emissions mask. In summary, Motorola urges the FCC to ensure adequate interference protection to incumbent 800 MHz SMRs during its wide area proceedings. This is best achieved by maintaining all aspects of the 800 MHz emission mask currently codified at §90.209(g) of the FCC's rules -- especially the sloped skirts outside the authorized bandwidth and the 50 + 10log(P) attenuation requirement in the adjacent channel -- for all 800 MHz SMR licensees. This will ensure continued high service quality to all users of the 800 MHz band without unduly limiting the flexibility of manufacturers to provide alternative wideband technologies.

I. Background.

In its Further Notice of Proposed Rule Making in PR Docket No. 93-144, the FCC proposed a new emissions mask for wide area 800 MHz SMR licensees.[1] This proposal was based on the FCC's policy that "where a licensee has exclusive use of a block of contiguous channels, such as in cellular and PCS, out-of-band emission rules would be applied only to the extent necessary to protect operations outside of the licensee's authorized spectrum."[2] Thus, the FCC proposed to "apply out-of-band emission rules only to the 'outer channels' of a wide area SMR license and to "spectrum adjacent to interior channels used by incumbents" such that the power of any emission is "attenuated below the transmitter power (P) by at least 43 + 10log(P), or 80 decibels, whichever is the lesser attenuation."[3] Subsequently, Ericsson, Inc. (Ericsson) filed an ex parte letter suggesting that the FCC incorporate the "skirts" of the existing 800 MHz mask in conjunction with the FCC's proposed "brick wall" mask.[4]

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[1] Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band, Further Notice of Proposed Rule Making, PR Docket No. 93-144, 10 FCC Rcd 7970 (1994) ["Further Notice"] at ¶42.

[2] *Id.*

[3] *Id.* at para. 43.

[4] Letter to Rosalind K. Allen, dated September 13, 1995, from Ericsson, Inc., PR Docket No. 93-144. The existing 800 MHz emissions mask is codified at §90.209(g) of the FCC's Rules.

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Motorola finds that these two proposals pose unnecessary risks to adjacent channel operations. For reasons further described below, Motorola recommends retaining the existing standards to provide continued protection to incumbent licensees.

II. The 800 MHz SMR Band is Not Now Comparable to the Cellular or Broadband PCS Frequency Bands.

The Commission's proposal to modify its 800 MHz emissions mask is based on the policy adopted in the CMRS Third Report and Order that the out-of-band emission limitations should only apply where the emissions have the potential to affect other licensee's operations. That document, however, noted the difference in adjacent channel use of the traditional SMR service and the cellular radio service and concluded that these differences "require the application of stricter emission mask standards to SMR systems than to cellular systems."[5] The Commission did conclude, however, to implement its approach for the proposed wide area SMR service.

In comments filed to the 800 MHz wide area SMR Further Notice, Motorola opposed the FCC's proposed emission mask because of the potential impact to incumbents occupying adjacent spectrum to the wide area SMR licensee. While the issuance of wide area SMR licenses will facilitate the consolidation of licensees in the top two hundred 800 MHz channels, the band will remain intermixed with wide area and incumbent licensees for at least the foreseeable future and, in some geographic regions, remain so indefinitely. Under this context, it is not appropriate to reduce the level of adjacent channel protection afforded to incumbent licensees.

The spurious and out-of-band emission limitations are the principal protection afforded to adjacent channel operations by the FCC's Rules.[6] Given the continued presence of multiple incumbent licensees in the post-auction world, Motorola believes that this band is not comparable to the relatively "clean" spectrum environments that exist in the cellular and broadband PCS band.[7] Rather, the Commission should continue to apply its existing technical standards at least until wide area licensees are able to clear a significant percentage of the incumbent licensees. Only when that occurs can wide area SMR licensees hope to achieve a degree of technical parity with other CMRS service providers.

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[5] Third Report and Order, GN Docket No. 93-252, PR Docket No. 93-144, PR Docket No. 89-553, FCC No. 94-212, released September 23, 1994 at ¶161.

[6] Section 90.621(b) states that 800 MHz operations will be afforded protection solely on the basis of fixed co-channel separation requirements. 47 C.F.R. §90.621(b). Without adjacent channel coordination, the only protection offered to adjacent channel operations is through the emissions mask and frequency stability requirements.

[7] Motorola recognizes that broadband PCS licensees will coexist with microwave systems for the near term. Unlike the SMR service, however, PCS licensees have the right to relocate incumbents to other frequency bands where adequate spectrum exists to accommodate all existing primary licensees. Even if SMR wide area licensees are afforded mandatory retuning rights, there is not sufficient spectrum in the comparable frequency bands to accommodate every incumbent SMR system in every market. It is also of note that the broadband PCS spectrum sharing arrangements requires maintaining the basic protection levels to the microwave incumbents that they previously received. This is the same policy approach supported here.

III. Resolution Bandwidth For Measuring 800 MHz Emissions Must Remain at 300 Hz.

The FCC's Refarming decision adopted new rules to require most out-of-band emissions to be measured using a spectrum analyzer set to a resolution bandwidth of 100 Hz.[8] Most recently, the FCC issued an Erratum in that proceeding to clarify that this policy was intended for operations conducted below 512 MHz and not 800 MHz devices.[9] Motorola applauds this action but remains concerned about the potential precedent and strongly urges the FCC to take no future action that would revise existing industry practices.

Reducing the resolution bandwidth from 300 Hz to 100 Hz would reduce the peak sideband power spectrum measurement results by approximately 5 dB.[10] Attached at Tab 1 are two plots of the same emission measured at the two settings with the §90.209(g) 800 MHz mask super-imposed. The peak power spectrum plot measured with a 100 Hz resolution bandwidth portrays the emissions as having 5 dB more margin to the mask. Therefore, allowing a resolution bandwidth of 100 Hz will allow manufacturers to increase the signal level of their emissions while still meeting the emissions mask. This creates greater energy in the adjacent channel and leads to greater interference.

Another depiction of the increased interference is contained at Tab 2 which has two plots showing the relative amount of power imposed into the adjacent 25 kHz channel by an emission that complies with the §90.209(g) 800 MHz mask. One emission is measured with a bandwidth of 300 Hz and the other 100 Hz. As shown, the level of energy placed into the adjacent channel by the emission measured at 300 Hz is 38 dB below the reference level while the emission measured at 100 Hz is only 33 dB below the reference level. This 5 dB of greater interference into the adjacent channel can reduce a typical 800 MHz facility's service area by 36 percent which can have serious affects on the profitability of 800 MHz SMR systems.[11] For these reasons, the FCC should not revise the proven industry practice of making such measurements using 300 Hz resolution bandwidth.[12]

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[8] Report and Order and Further Notice of Proposed Rule Making, (hereinafter Report and Order) PR Docket No. 92-235, FCC 95-255, released June 23, 1995. Motorola has petitioned for reconsideration of this action.

[9] Erratum, PR Docket No. 92-235, DA Number 95-2217, released October 27, 1995.

[10] This loss can be calculated from the formula 10 log(300/100).

[11] See Tab 3 for a description of how this loss of service area was calculated.

[12] This is consistent with the rules for the cellular radio service which state that out-of-band emissions (those that are part of the modulation itself as opposed to spurious emissions) must be measured using a resolution bandwidth of 300 Hz. See 47 C.F.R. Section 22.907(j)(1)(i) and (j)(2)(i).

IV. The FCC's Existing 800 MHz Mask Provides Adequate Interference Protection to Incumbents.

For wide area 800 MHz SMR licensees, the FCC is now considering whether it should replace its §90.209(g) 800 MHz mask with its proposed "brick wall" mask imposed at the spectrum block edges and the modification proposed by Ericsson that further extends the proposed mask by "picking up" the "skirts" of the §90.209(g) 800 MHz mask. Motorola believes that the existing §90.209(g) 800 MHz mask provides incumbent licensees adequate protection and should be retained at least until the SMR frequency band is consolidated to the point that its better approximates the cellular radio service.

Attached at Tab 4 are three plots showing the amount of energy placed into an adjacent 25 kHz spaced receiver from an emission that satisfies 1) the existing emissions mask of §90.209(g) measured with 300 Hz resolution bandwidth, 2) the FCC's proposed brick wall mask (100 Hz resolution bandwidth), and 3) Ericsson's proposed modification of the brick wall mask also measured with the 100 Hz resolution bandwidth. As shown, the resultant relative power in the adjacent spectrum are 1) -38 dB, 2) -35 dB, and 3) -32 dB. Under this analysis, the FCC's proposed mask measured with a resolution of 100 Hz degrades adjacent channel protection by 3 dB over existing rules and Ericsson's proposed modification would degrade it by another 3 dB. A 6 dB reduction in adjacent channel protection can reduce service area by 42 percent (calculated using the same method as described at Tab 3).

Equally important, both the FCC's proposal and Ericsson's modification of that proposal would raise the overall noise floor of the 800 MHz band. In the first adjacent channel, the existing §90.209(g) mask requires attenuation of 50 + 10Log(P) which is 7 dB more stringent than the proposed 43 + 10Log(P).[13] One of Motorola's concerns is that noise from multiple transmitters will add and cause significant interference in this area of the spectrum. Furthermore, the FCC's type acceptance procedures would probably not address this issue since that analysis typically focuses on the compliance of individual transmitters. Thus, the FCC should maintain a greater attenuation level in the spectrum immediately outside the spectrum block to address this phenomenon. Under this analysis, the existing emission mask with a required attenuation of 50 + 10 log(P) best serves the needs of the SMR industry.

V. Conclusion.

Adoption of the FCC's proposed "brickwall" block mask profile could possibly extend an incumbent's interference free area due to an estimated 3 dB reduction of interference permitted in the adjacent channel provided that the FCC maintains a resolution bandwidth requirement of 300 Hz. Any improvement gained by the "brickwall" mask is lost if its adoption is accompanied by other changes.

[13] Motorola agrees with the traditional attenuation level of 43 + 10Log(P) for measuring spurious emissions as contrasted to out-of-band emissions since spurs from multiple transmitters are generally not correlated and non-additive.

Most importantly, reducing the noise floor limit to 43 + 10 log(P) along with decreasing measurement resolution bandwidth to 100 Hz would permit 12 dB more adjacent channel noise than allowed under previous regulations regardless of the emission mask profile. These two factors would significantly reduce the interference free coverage area of incumbents and it is therefore recommended that 50 + 10 log(P) be maintained as the adjacent channel interference noise floor with 300 Hz specified as the required measurement resolution bandwidth. In addition, another 3 dB degradation in adjacent channel protection would occur if the block mask profile was modified to include the "skirts" of the §90.209(g) mask in the adjacent channel. It is therefore recommended that this not be done.

We appreciate your attention to this matter. Please feel free to follow up with us at your convenience.

Sincerely,

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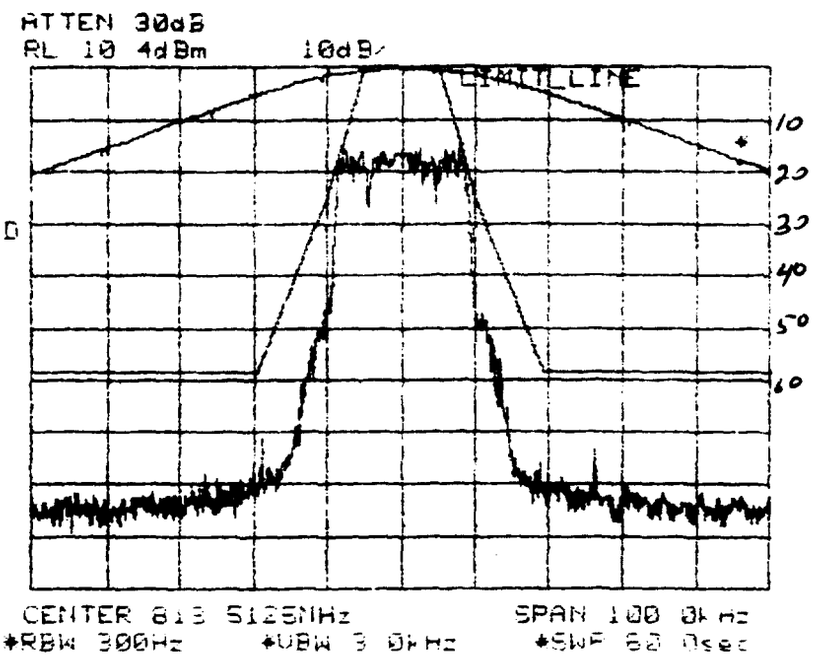
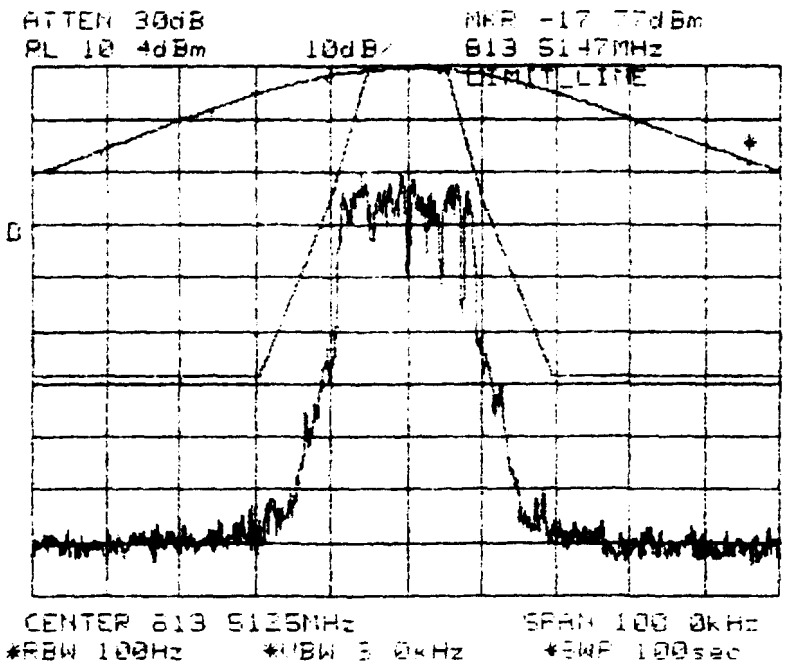
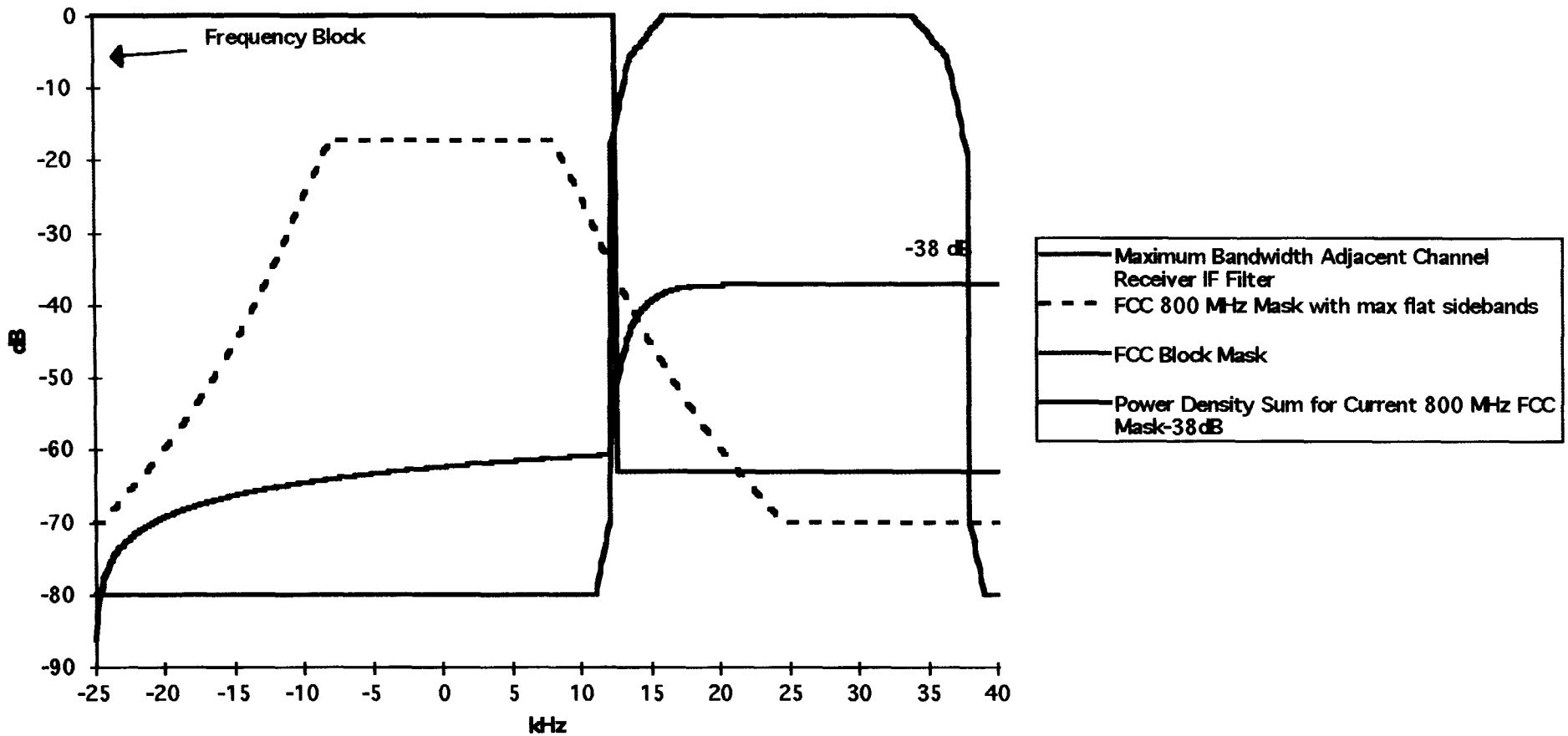


Peak Detect, 90.209 (g) Mask
Res. Bandwidth = 300 Hz 10/18/95

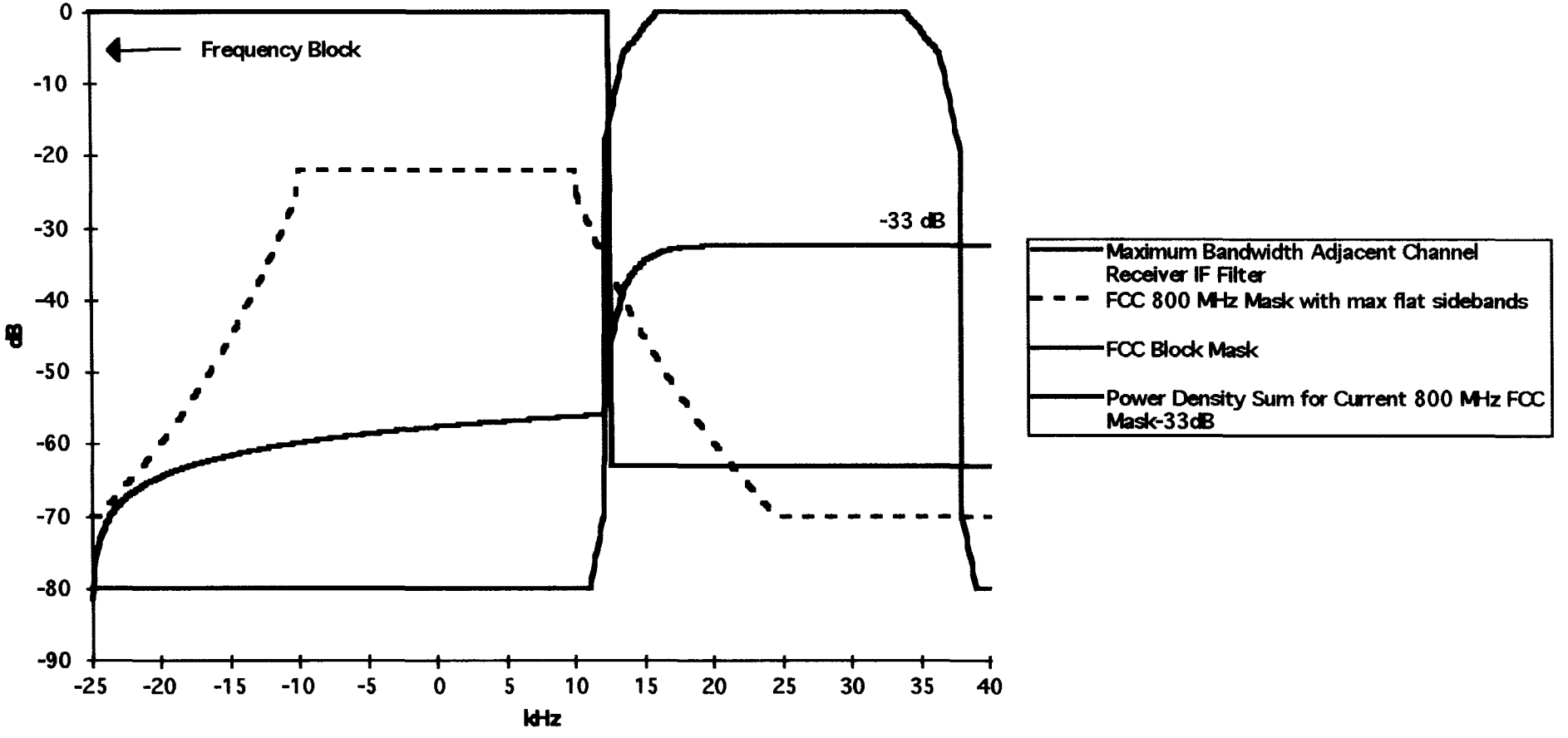


Peak Detect, 90.209 (g) Mask
Res. Bandwidth = 100 Hz 10/18/95

Mask Peak Power Density Summation Curve
Current FCC 800 MHz Mask - 300 Hz Res BW



Mask Peak Power Density Summation Curve
Current FCC 800 MHz Mask - 100 Hz Res BW



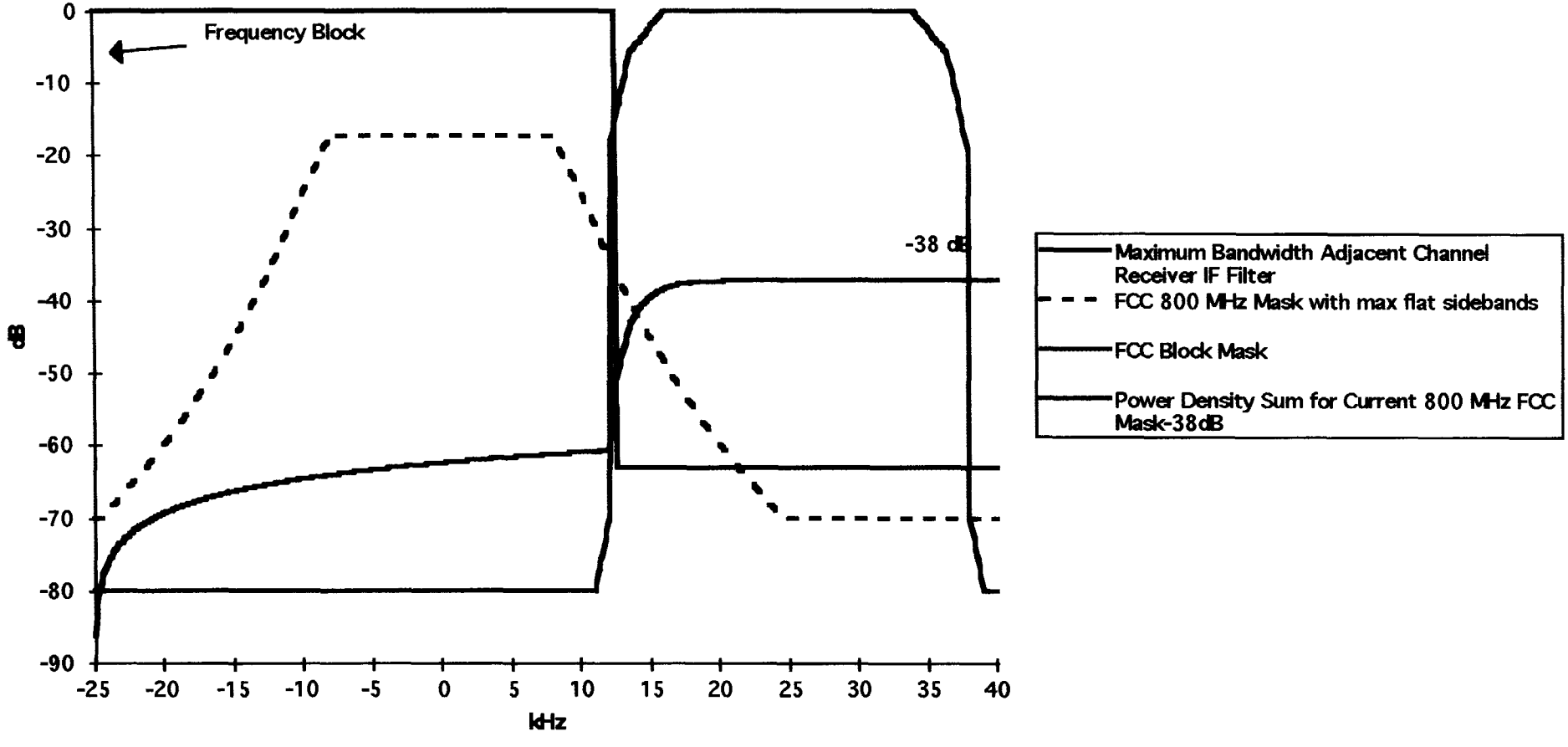
The purpose of this showing is to compute the effect of an increase in interference of 5 dB in the base receiver of a typical 800 MHz SMR. First, the range of the SMR will be computed assuming no interference is present. Then the range will be computed assuming the desired signal must increase by 5 dB to overcome 5 dB of noise power.

The typical 800 MHz SMR will have a static receiver sensitivity of -118 dBm referenced at the output of the base antenna. It will have a 20 foot aperture antenna with 13 dBd of gain at a HAAT of 1000 feet (304.8 meters). The mobile will have a 10 watt transmitter with a 3dB antenna design which has been shown to have 1 dBd of effective antenna gain in the multipath environment. There is a 1 dB of coaxial cable loss between the mobile transmitter and antenna.

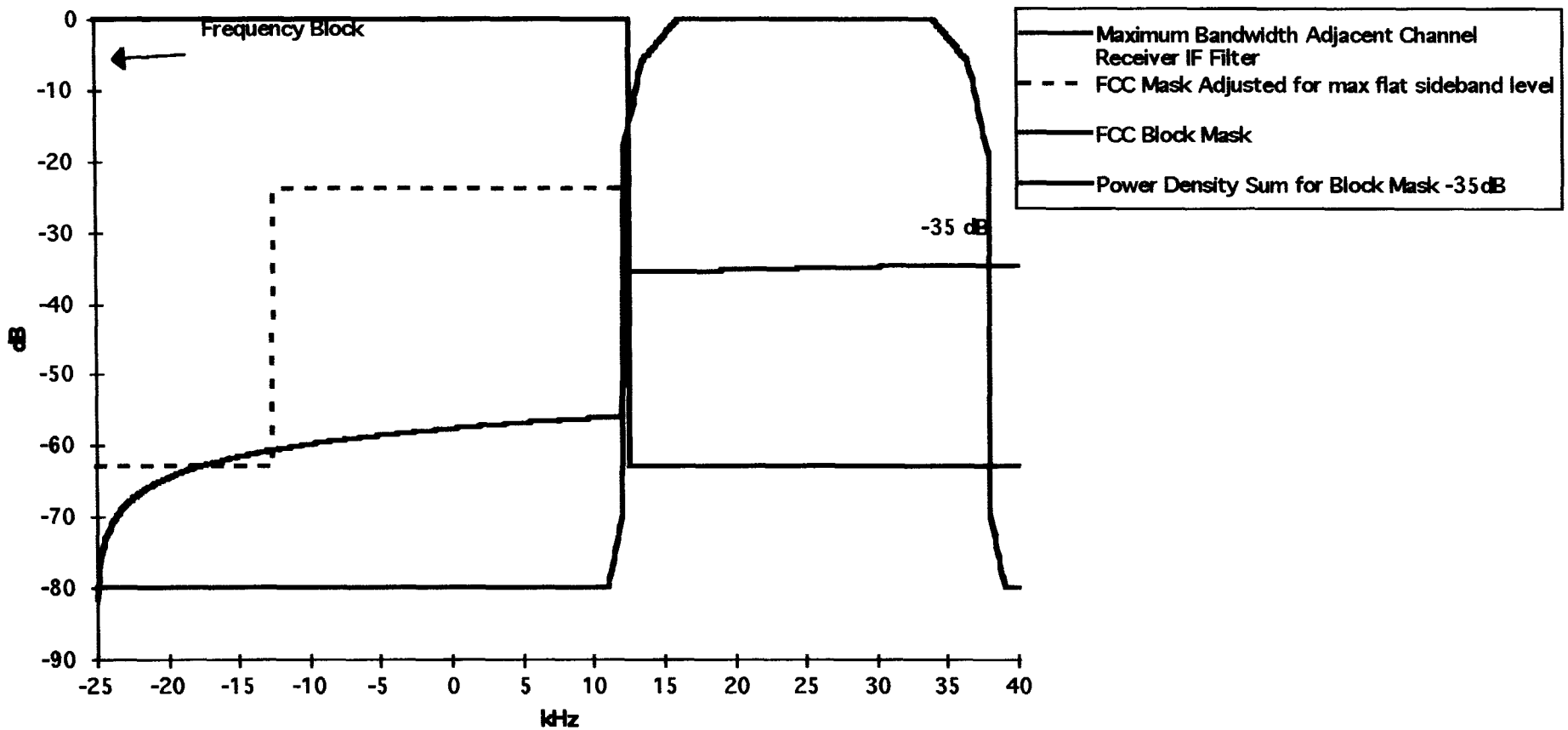
The system gains and losses are shown in the table below, resulting in a total system range of 153 dBd. By reference to the Okumura propagation curves, at a base at height of 1000 feet (304.8 meters), the geographical range is found to be 19.7 miles (31.7 km) in an urban environment. When the system gain is reduced by 5 dB as a result of interference noise at the base receiver, to 148 dB, the range is reduced to 15.7 miles (25.3 km). This represents a reduction in geographic range of 20% or a reduction in coverage area of 36%.

Power output 10 w	+40	dBm	
Coaxial Cable	- 1	dB	
3 dB Antenna Gain	1	dBd	
log normal 90% coverage	- 8	dB	
Rayleigh 90%	-10	dB	
Okumura 50% urban	-PL		
Base 20 foot antenna	+13	dBd	
Received Power level	-188 dBm =		35 - PL
		PL =	153 dBd

Mask Peak Power Density Summation Curve
Current FCC 800 MHz Mask - 300 Hz Res BW



Mask Peak Power Density Summation Curve
FCC Proposed Block Mask - 100 Hz Res BW



Mask Peak Power Density Summation Curve
EGE Proposed Block Mask - 100 Hz Res BW